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ABSTRACT

A special 90-minute educational session of the Association of School Business Officials' annual meeting presented a series of mini-workshops, each featuring a school district or organization that had developed and/or implemented a successful program to reduce energy usage in schools. The 19 presenters at these mini-workshops included school administrators as well as representatives from energy-related federal, provincial, and state governmental entities who were knowledgeable about energy conservation programs for schools. Schoolhouse Energy Efficiency Demonstration (SEED), a project supported by Tenneco, Inc., as a public service, conducted 20 demonstration energy audits in the United States. Descriptions of the overall SEED project and of the energy programs of two of the school districts that participated in SEED comprise the middle section of the booklet. The 19 presentations in the booklet are based on brief written summaries, distributed at the session, of each organization's exemplary energy conservation program and on supporting materials submitted for participation in the program. In addition to sharing energy conservation ideas and proven techniques, the presentations provide a resource listing of the names, addresses, and phone numbers of individuals and organizations willing to share greater details about their programs with other educators. (Author/MLF)

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Energy Conservation and Management

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A series of field proven energy management programs that are helping school districts reduce their costs and their energy consumption.

Association of School Business Officials of the United States and Canada

EA 014 758

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THE ASSOCIATION OF SCHOOL BUSINESS OFFICIALS OF THE UNITED STATES AND CANADA is an international professional educational organization, incorporated not for profit, and is the oldest and largest education organization in North America devoted exclusively to the improvement of school business management. Its main objectives are to encourage the wise expenditure of taxpayers' monies, and to improve efficiency in the practice of school business management.

Energy Conservation and Management

Tried and proven energy conservation programs that are helping school districts improve the energy efficiency of their facilities.

As presented during a Special Session on Energy Management at the 66th Annual Meeting and Exhibits of the Association of School Business Officials, October 27, 1980, New Orleans, Louisiana

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Preface

The basic underlying professional objective of the Research Corporation of the Association of School Business Officials (RC-ASBO) is to identify and share timely, appropriate information about successful school business management programs and practices. This publication is just one example of how RC-ASBO programs meet that objective. It presents field-proven school energy conservation programs, practices, procedures and ideas that can assist educators who grapple with the resource allocation challenges caused by the international energy situation; specifically, dwindling supplies of energy sources and skyrocketing energy costs.

The energy conservation programs presented in this publication are representative of a broad spectrum of school and school-related organizations.

In addition to sharing valuable energy conservation ideas and proven techniques, the programs presented in this book provide a resource listing of the names, addresses and phone numbers of individuals and organizations who are willing to share greater details about their respective programs and energy saving ideas with other educators.

Donald G. Buchan
Executive Director, RC-ASBO

Introduction and Acknowledgements

During its 66th Annual Meeting and Exhibits in New Orleans, Louisiana, October 26-30, 1980, the Association of School Business Officials of the United States and Canada presented a special 90-minute educational session entitled "Energy Management." This session presented a series of mini-workshops, each featuring a successful, field-proven practice, method or technique to conserve energy in schools.

The presenters at these mini-workshops were school administrators and representatives from energy-related federal, provincial and state governmental entities extremely knowledgeable about energy conservation programs for schools. Each presenter's school district or organization had developed and/or implemented a successful program to reduce energy usage in schools.

During the Special Session on Energy Management, each presenter described his organization's exemplary energy conservation program which provided the basis for a brief written summary — a "Tip Sheet" — that was included in a "Gold Mine" Packet and distributed to everyone in attendance.

The material presented in this book is based on those tip sheets and the supporting materials submitted to the Association when each school district and organization applied for participation in the program.

ASBO acknowledges the contributions made by these presenters and by those within the presenters' respective school districts and organizations to the success of the Special Energy Management Session whose diligent work and dedication were responsible for developing and implementing the energy conservation programs described on the following pages. All participants have agreed to have the material presented during the Special Session included in this ASBO publication so that their experiences can be shared with other school administrators across the United States and Canada.

Those who participated in the Special Session on Energy Management at ASBO's 66th Annual Meeting and Exhibits were:

D. L. Anderegg, RSBA, Assistant Superintendent, Business Services, Racine Unified School District, Racine, Wisconsin.

Dr. Wilton Anderson, Director, Energy and Education Action Center, U. S. Department of Education, Washington, D.C.

Robert Bartley, Assistant Director, Delaware Energy Office, Dover, Delaware.

A. A. Bourassa, Secretary-Treasurer, School District No. 62 (Sooke), Victoria, British Columbia.

Frank L. Hawkins, PE, Manager of Support Services, Portsmouth Public Schools, Portsmouth, Virginia.

Keith Hawkins, School Plant Manager, Greater Victoria School District No. 61, Victoria, British Columbia.

Wayne Mann, RSBA, Assistant Superintendent Business Affairs, Palos Community Consolidated School District 118, Palos Park, Illinois.

Paul R. McDevitt, RSBA, Assistant Superintendent, Mamaroneck Public Schools, Mamaroneck, New York.

Leonard E. Merrell, Director Budget and Accounting, Garland Independent School District, Garland, Texas.

Robert A. Nanni, RSBA, Business Manager, Leyden Community High Schools, Franklin Park, Illinois.

Reginald C. Palmer, Assistant Maintenance Supervisor, The St. James-Assiniboia School Division No. 2, Winnepeg, Manitoba.

Wallace Piper, Executive Director, Michigan School Business Officials, East Lansing, Michigan.

Robert T. Pritchard, Executive Director, MASBO Cooperative Corporation, Newton, Massachusetts.

Lester H. Reinhart, RSBO, Supervisor of Buildings and Grounds, Pottstown School District, Pottstown, Pennsylvania.

Billie I. Reynolds, Executive Director, National School Transportation Association, Springfield, Virginia.

Donna L. Rybiski, Manager of Public Affairs, Tenneco, Inc., Houston, Texas.

Wayne E. Schaible, Superintendent of Schools, Schaumburg School District No. 54, Schaumburg, Illinois.

Richard L. Wingfield, Jr., RSBA, Assistant Superintendent, Business Affairs, Newport New Public Schools, Newport News, Virginia.

Adrian T. Wisniewski, PE, Director, Physical Plant Division, Milwaukee Public Schools, Milwaukee, Wisconsin.

Charles G. Stolberg
Editor

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Section 1

Total Energy Management Programs

Fitting the Pieces Together

As presented by:
Wallace B. Piper
Executive Director
Michigan School Business Officials (MSBO)
516 Erickson Hall
East Lansing, MI 48823
Phone: 517/355-1720

The Michigan Association of School Business Officials (MSBO) has developed an energy conservation and management program for schools. Goals for the program are:

- to enhance awareness of the energy problem and possible solutions in the schools
- to encourage the use of energy management tools
- to make energy management expertise available to all schools in Michigan
- to bring about a sizeable reduction in energy usage

To accomplish these goals, MSBO has developed a broad range of training sessions and instructional tools. Programs include:

Energy Management for School Administrators — A program to provide school administrators with practical guidelines for developing and implementing a successful energy conservation program in their district or building. Included are sections on recognition and definition of the problem; policy development and administrative organization for energy management; data collection and accountability; and the administrators' roles in the energy audit process.

Energy Audits: How to Conduct Your Own Mini-Audits — A program for maintenance engineers on how to conduct an energy audit to identify quick-fix operation and maintenance changes to maximize energy savings and to recognize potential areas of refit or systems convert. Emphasis is placed on light-level reduction, ventilation reduction, temperature reduction, unoccu-

pied shutdown and operational changes. Included is a slide-tape presentation outlining the role of the energy audit in an energy conservation program for schools.

Quick Fix Energy Conservation for Custodial Personnel — A program designed for school custodians to orient them to the need for energy conservation, and ways they can support such a program during day-to-day operations. The workshop includes practical actions custodians can take in the areas of light-level reduction, ventilation and temperature reduction, unoccupied shutdown and reduction of infiltration.

Preventive Maintenance: An Introduction and Some Practical Approaches to Setting Up a System — A program outlining how a good maintenance program can save labor time, extend equipment life and save energy. The workshop includes a down-to-earth presentation of how a preventive maintenance program can be developed and implemented in a school system.

Transportation and Energy Conservation — An outline and review of techniques for saving energy in a school transportation fleet. The program contains units on service and maintenance, data collection, driving techniques, scheduling and routing and on purchasing for fuel conservation.

Maximum energy conservation takes Total Energy Management. MSBO believes all elements of the education community must become involved in an on-going program to save energy. Consequently, MSBO has developed and presents training sessions addressing the varied actors and their roles in a total energy conservation program.

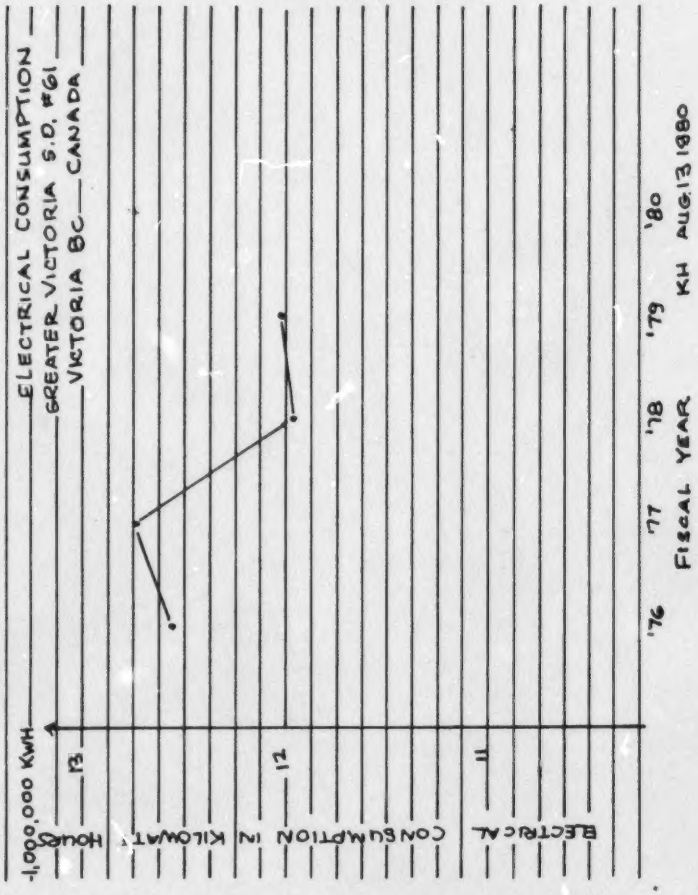
Energy Management is People Management

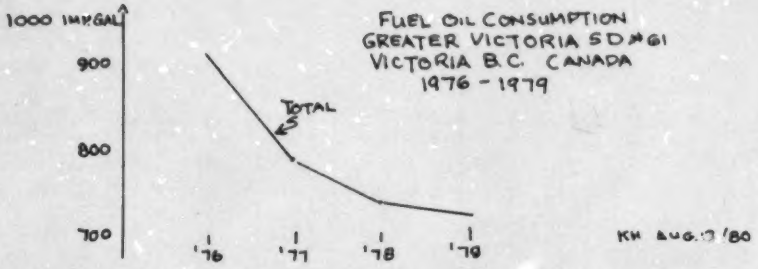
As presented by:
Keith Hawkins
School Plant Manager
Greater Victoria School District #61
3128 Foul Bay Road
Victoria, British Columbia, Canada, V8W 2R1
Phone: 604/592-1211

Any energy management program will only be as effective in reducing the use of energy in a building as the users of the building are supportive of the goals and objectives of the program.

The level of support which users will give a program will depend on how

clearly the goals and objectives are described and understood by everyone; how meaningful and relevant the guidelines and information are; the degree of ownership individual users have to the program; and finally the peer group pressure and example set by all users of the building.

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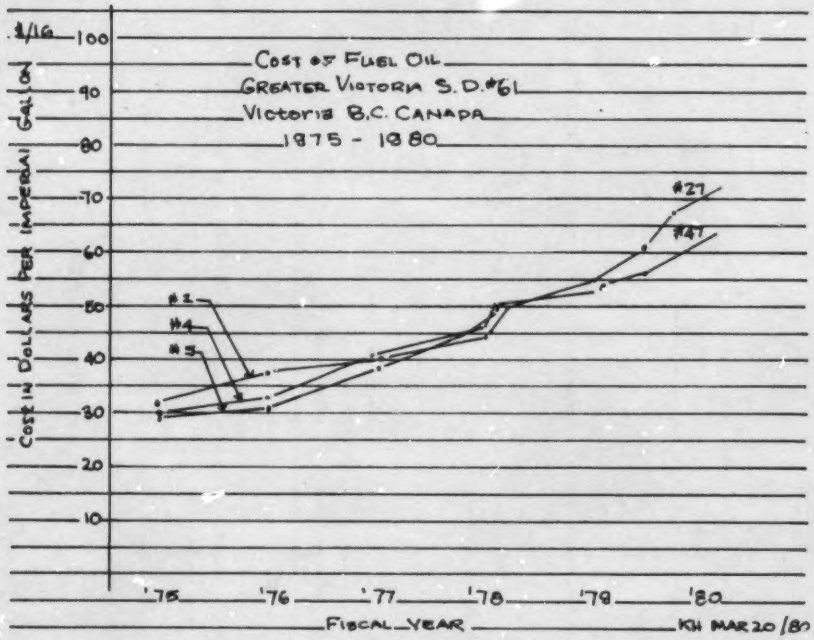
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COST IN DOLLARS PER IMPERIAL GALLON
COST OF FUEL OIL
GREATER VICTORIA S.D.#61
VICTORIA B.C. CANADA
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#4
#3
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Conservation Measures That Pay Off in Big Bucks

As presented by:
Richard L. Wingfield, Jr., RSBA
Assistant Superintendent, Business Affairs
Newport News Public Schools
12465 Warwick Boulevard
Newport News, VA 23606
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One of the greatest problems facing school systems today is how to get the most out of each dollar. The cost of energy continues to take a greater part of each school budget. There is little that can be done to reduce the cost of energy, but there is much that can be done to reduce the amount of energy consumed by a school system.

Whether a school system is large or small, it can take energy conservation measures that will pay off in big bucks. Newport News Public Schools serve approximately 27,000 students, employ 3,000 persons and maintain 45 buildings.

The Newport News Public Schools reduced electricity use from 27,516,513 KWH in 1976-77 to 21,805,200 KWH in 1979-80 for a total reduction of 5,711,313 KWH. During this same period, fuel oil consumption has decreased from 1,162,138 gallons to 754,344, a total reduction of 407,683 gallons. These reductions are a credit to all personnel associated with the school system. Everyone is indeed proud to be a part of this accomplishment.

How has this savings been accomplished? Listed below are several ways that energy consumption has been reduced:

1) The School Board adopted as one of its management objectives a reduction in the amount of energy used by the school system.
2) Support for energy conservation was obtained from students, teachers, support staff, administrators and parents.
3) Energy conservation units were developed to be incorporated into the curriculum.
4) Schools held poster and essay contests.
5) The School Board appointed an Energy Committee and retained the services of a consulting engineer.
6) Audits of several schools were conducted by the consulting engineer, our local utility company and Newport News shipyard.
7) A program was initiated to caulk windows and weatherstrip doors.
8) Ceilings were insulated in multi-purpose rooms.

9) Controls we installed for hot water pumps and clock controls for buildings.
10) All fluorescent bulbs were replaced as they burned out with econo-watt bulbs which burn 8 watts less.
11) Windows were partially sealed at two schools where there was a great deal of heat loss.
12) Overhead stage doors at five schools were closed up.
13) A secondary pumping system was installed in one high school that paid for itself in 16 months.
14) A program now underway coverts fuel from fuel oil to natural gas in eight schools.
15) The Adult Education Department distributed energy saving packets to adult students.

Results of Energy Management Program: St. James-Assiniboia School Division

As presented by:
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Phone: 204/888-7951

In 1977 we began looking into the mounting costs of light, water and power in our school division and what could be done to reduce these costs. We approached the subject in two ways:

1) What can we do at no cost to the Division?
2) Can we justify the cost of hiring mechanical engineers to audit our buildings and make recommendations?

Phase 1: We looked at the lighting levels in our schools and found the schools built in the last 20 years had very high levels. Each school was checked with a light meter and all readings recorded. We delamped three schools as a

test program from September to December. The lighting levels were those recommended by the Illuminating Engineering Society. In this period, the reduction in electrical consumption was 24% per school.

These results were presented to our Board who approved the delamping of all schools to the light levels recommended by the Illuminating Engineering Society.

In addition, classroom thermostats were lowered to 68°F. Air conditioning equipment thermostats were changed to operate above 78°F.

This program, along with caulking of windows and weather stripping was completed at low cost to our Division and resulted in significant reductions in energy usage.

Phase 2: The second phase of our program was more complex. A mechanical engineering firm was hired to audit seven schools. As an example of the program used in these schools the following information is from Hedges Junior High School, which is our highest cost school:

Energy Analysis Study — April, 1978.

The Energy Analysis Study of Hedges Junior High School included descriptions of the building's construction; the building's mechanical and electrical systems; present operating procedures; present energy consumption; and analysis of data and recommendations with respect to potential energy use reduction.

The study was carried out during the months of February and March, 1978. The analysis was broken down in the following way:

1) *Building Data* — 1.1 General, 1.2 Building Areas, 1.3 Building Construction, 1.4 Building Condition and 1.5 Building Occupancy and use.

2) *Mechanical Systems* — 2.1 Description of Mechanical Systems, 2.2 Operation of Mechanical Systems and 2.3 Condition of Mechanical Systems.

3) *Electrical Systems* — 2.1 Description of Electrical Systems, 3.2 Operation of Electrical Systems and 3.3 Condition of Mechanical Systems.

4) *Energy Consumption*

5) *Recommendations* — 5.1 Building, 5.2 Mechanical Systems and 5.3 Electrical Systems.

5-Recommendations

5.1 Building

5.1.1 Roof—When scheduled roof repairs are conducted in the near future, care should be taken to ensure that the extent of the repairs includes replacement of all roof insulation which has become wet due to roof leaks.

5.1.2 Entrance Doors—The fit at all entrance doors and thresholds should be adjusted to reduce or eliminate the air space at the bottom of the door, to reduce air filtration at that point.

5.1.3 Opening Windows—5.1.3.1—We would recommend strongly that all horizontal sliding windows be removed and replaced with sealed insulated in-fill panels having a minimum value of R20, and higher if practical.

5.1.3.2—Consideration should be given to replacing the hopper type opening windows with insulated panels, as above,

or at the very least, they should be sealed closed with a good quality caulking compound or weatherstripping.

5.2 Mechanical

5.2.1—The air supply quantities to individual rooms are based generally on a ventilation rate which is higher than the current standard. Total air supply quantity from each of the four systems should be reduced to the minimum cfm which will maintain adequate ventilation and required space temperature conditions. Such a reduction will offset both demand and consumption charges.

The gymnasium system in particular is supplying more air than required for current ventilation standards. By reducing the total air quantity from 13,875 cfm to 10,50 cfm and by raising the mixed air temperature from 55°F to 60°F, the peak load imposed on the gym heating coil will be reduced.

5.2.2—Repair the malfunctioning control of mixing air dampers for units F1 and F2. Recheck operation of mixed air control for units F2 and F4.

5.2.3—Check and adjust all fresh air dampers to eliminate leakage on shut off.

5.2.4—Repair and adjust relief dampers in west fan room. As a first step, disconnect the controller to the relief dampers for F3 and leave them in the closed position. Adjust relief dampers for F4 to eliminate leakage on shut off.

5.2.5—For the four supply units, increase the mixed air temperature from 55°F to 60°F, during occupied mode.

5.2.6—For the four supply units, change the time clock settings so that the occupied mode is from 9:00 a.m. to 3:30 p.m. Monday to Friday. Eliminate night and weekend occupied settings.

5.2.7—Separate the timing of the operation of the day-night thermostats from that of the occupied-unoccupied functions of the air supply systems. Add four time clocks to actuate the day-night thermostats. This will allow sequencing of the warm-up period in each of the four main building zones prior to the introduction of fresh air for ventilation. The settings of the day cycles of the four thermostats could be approximately 6:00 a.m. to 4:00 p.m.; 6:30 a.m. to 4:00 p.m.; 7:00 a.m. to 4:00 p.m.; 7:30 a.m. to 4:00 p.m.; Monday through Friday.

The functioning of these thermostats should be monitored closely to ensure that the warm-up period does not contribute to the peak electrical demand of the school.

5.2.8—The control for the reheat coil from Room 160 must be repaired. The proper functioning of all reheat coil controls should be checked and necessary repairs made after air quantities have been reduced.

5.2.9—The temperature indicating gauges on the control panels for the four air supply systems should be recalibrated to indicate correct temperatures. A program should be instituted for logging the supply temperature from each system, twice each day: once on occupied cycle and once on unoccupied cycle. This is a practical basis for keeping track of the proper functioning of the mixed air dampers, which is critical to energy use in the school.

5.2.10—Exhaust fans F9, F15, F16 and F17 should run only when the school is occupied: preferably during the period 9:00 a.m. to 3:30 p.m., Monday to Friday.

If the limited running time proves satisfactory, automatic switching of the fans can be achieved by interconnecting them with occupied - unoccupied time clocks for the air supply units.

5.2.11—The exhaust fans in the shop areas should be run only when required by the operations taking place in the shops. Consideration might be given to locating a sign at each exhaust fan switch stating "*run only when necessary*".

5.2.12—Raise the switch over temperature from winter to summer operation from 55°F to 50°F.

5.2.13—Change the control of the refrigeration (summer cooling) systems, from discharge control at each unit to respective zone thermostats (present day-night thermostats).

5.2.14—In order to reduce summer power consumption, manually disconnect power to the individual reheat coils at the various panels. This will result in an uneven cooling effect but may prove satisfactory. In particular areas where over-cooling causes discomfort, consideration can be given to further reducing supply air quantities or specific reheat coils can be reactivated on a selective basis.

5.2.15—Most gymnasium areas function reasonably without air conditioning. Disconnect power supply at the breaker, to the 30 ton condensing unit for gym supply unit F4. Close the breaker manually only on a very selective basis, i.e., when the gym is used for large gatherings of people for an extended period or in extremely warm weather. This will not reduce demand, which is established in the winter, but will reduce consumption.

5.2.17—Consider lowering the settings on the fan systems mano-meters used to indicate when filters should be cleaned. These appear somewhat high. In reducing air quantities supplied to the building, it becomes more important to maintain the redesigned quantities to individual spaces.

5.3 Electrical

5.3.1 Lighting—The delamping program carried out to date has resulted in an overall lowering of the lighting systems electrical power requirements. The resulting lighting levels are in our opinion adequate in most areas.

5.3.2 Hot Water Tanks—The domestic hot water tank heaters can be put on time controls and set such that only three or even fewer of the six tanks are on at any one time during the day from 8:30 a.m. until 6:00 p.m.

5.3.3 Fresh Air Damper Control—The outside air dampers on the four air handling systems may be controlled on a time basis to allow these to cycle such that some are closed completely a portion of each hour during the winter months.

5.3.4 Kiln—To operate only after 4:30 p.m.

After the recommendations were completed, an operating manual was prepared for the mechanical and electrical systems in simple terminology for the custodians. The complete manual was reviewed with the custodians so

that they understood the function of each and every gauge and dial. This is very important to insure all equipment is operating correctly, and if not, what action is required to correct it. We find this is the biggest problem with our custodians. Their supervisors do not take the time to show them how the equipment works. They give the new custodians the operating manual to read and do not return to go through the school with them to familiarize them with the equipment. If they do not understand the manual, they will lose interest and the operating procedure will break down and your savings will soon disappear. Make it interesting for your custodians and they will respond.

Results

The consumption (adjusted for the difference in degree days) for the three months November, 1978, December, 1979 and January, 1979 was down an average of 42% when compared with the same three months the previous year. This represents savings for those three months, at 1978 rates, of over $3,000. We estimated the savings from these figures to be $14,000 per year. The total reduction in consumption in 1979 over 1978 was 33.5%. Cost to implement recommendations and engineering fees was $13,400. Pay back period=one year.

St. James-Assiniboia School Division No. 2 — February, 1980

Energy Comparison Report

Year	Average for Division BTU/SqFt/DD	Percentage Change in Energy Consumption from Previous Year	Total Annual Cost of Energy	Annual Savings due to Energy Conservation Program
1977	20.97	—	$792,241	—
1978	17.38	Decrease 17%	842,630	$143,255
1979	15.88	Decrease 8%	878,270	$219,567*

* Represents total energy saving of 25%.

Energy Consumption Analysis

1977 Consumption (KWH)	Demand	1980 Consumption (KWH)	Demand	Month
275000	700	154000	470	Jan.
285000	650	237000	460	Feb.
141000	560	96000	380	Mar.
149000	510	89000	360	Apr.
162000	640	29000	250	May
191000	625	32000	315	June
123000	592	16000	266	July
24000	592			Aug.
79000	592			Sept.
135000	610			Oct.
143000	545			Nov.
304000	620			Dec.

ENERGY REPORT

St. James-Assiniboia School Division No. 2

Percentage Comparison

Schools	B.T.U./Sq. FL/D.D. 1978	1979	Percentage Increase/Decrease
Those schools with energy adjustments on the advise of Scouten, Mitchell			
Hedges Junior High	16.67	9.93	40.43%–
S.C.R.S.S.	23.68	18.69	21.07%–
John Taylor	23.40	18.93	19.1 %–
Buchanan	22.51	20.22	10.17%–
Bruce Junior High	27.19	18.74	31.07%–
Butterworth-Krawchyk	25.05	24.51	2.15%–
Those schools with work manual prepared for them			
Westwood Collegiate	16.66	16.11	3.30%–
St. James Collegiate	20.03	19.33	3.49%–
Alex. Ross	10.38	8.42	18.88%–
Heritage	6.86	7.60	10.78%–
Stevenson	17.09	13.45	21.29%–
Sansome Junior High	14.99	15.12	.86%–
Ness Junior High	17.56	17.13	2.44%–
Lakewood	12.97	12.70	2.08%–
Spring Valley	15.37	13.29	13.58%–
Voyageur	8.33	7.24	13.08%–
Bedson	6.38	5.02	21.31%–
Robert Browning	19.70	18.81	4.51%–
Arthur Oliver	8.19	9.34	14.04%–
Columbus	24.92	23.68	4.97%–
Remainder of Schools			
Allard	15.67	15.51	1.02%–
Assiniboina	22.22	21.85	1.66%–
Athlone	19.46	17.97	7.65%–
Bannatyne	12.56	12.23	2.62%–
Birchwood	28.54	30.02	5.18%–
Britannia	17.80	15.35	13.76%–
Brooklands	17.71	20.01	12.98%–
Crestview	15.59	15.81	1.41%–
Deer Lodge	15.70	17.97	14.45%–
Golden Gate	15.89	16.04	5.03%–
Jameswood	13.27	13.93	4.97%–
Kirkfield Park	20.52	20.63	.48%–
Lincoln	15.14	15.00	.92%–
Linwood	14.55	14.85	1.36%–
Phoenix	21.09	20.37	3.41%–
St. Charles	4.99	5.98	19.83%–
Silver Heights Collegiate	14.32	14.93	4.25%–
Strathmillan	15.95	16.18	1.44%–
Woodhaven	13.71	13.60	.80%–

An additional 14 school audits were completed and operating manuals were prepared. Although no changes were made to the mechanical

equipment; the custodians now understand the operation of all the equipment and monitor it by keeping a daily log.

RECORD OF DAILY FUNCTIONS

SCHOOL Hedges — Gym

MONTH	PANEL F. 1 MIXED AIR a.m.	PANEL F. 1 MIXED AIR P.m.	PANEL F. 1 SUPPLY AIR a.m.	PANEL F. 1 SUPPLY AIR P.m.	PANEL F. 1 DNA SWITCH	PANEL F. 2 MIXED AIR a.m.	PANEL F. 2 MIXED AIR P.m.	PANEL F. 2 SUPPLY AIR a.m.	PANEL F. 2 SUPPLY AIR P.m.	PANEL F. 2 DNA SWITCH	PANEL F 3 MIXED AIR a.m.	PANEL F 3 MIXED AIR P.m.	PANEL F 3 SUPPLY AIR a.m.	PANEL F 3 SUPPLY AIR P.m.	PANEL F 3 DNA SWITCH	PANEL F 4 MIXED AIR a.m.	PANEL F 4 MIXED AIR P.m.	PANEL F 4 SUPPLY AIR a.m.	PANEL F 4 SUPPLY AIR P.m.	PANEL F 4 DNA SWITCH	TIME CLOCK SETTING (MON. ONLY)
	60	60	66	72	D	60	68	60	72	D	70	68	74	68	N	66	60	86	80	P	C
	59	59	72	72	D	60	69	63	71	D	74	72	74	71	N	66	68	80	80	N	
	61	70	71	71	D	64	67	64	73	D	72	71	73	69	N	66	65	80	82	N	
	60	68	70	72	D	62	68	62	70	D	65	70	72	70	N	60	66	80	81	N	C
	58	64	60	66	A	54	66	60	68	A	64	64	65	66	A	58	54	80	74	A	
	58	60	60	64	AE	54	66	58	66	A	65	66	64	70	A	56	60	74	80	A	
	57	46	58	60	AE	54	66	60	66	A	66	76	65	70	A	60	66	88	80	A	
	56	64	60	66	AC	53	60	60	64	A	66	74	68	72	A	60	64	92	80	A	C
	58	60	61	68	A	58	62	61	72	A	66	75	66	71	A	62	62	88	80	A	
	60	58	62	70	A	58	66	62	74	A	66	72	66	74	A	61	68	85	84	A	
	60	59	60	69	A	58	66	61	72	A	66	73	66	72	A	60	65	86	83	A	
	59	66	62	70	A	60	68	63	72	A	66	72	67	72	A	61	60	83	84	A	
	58	64	60	70	A	54	60	61	72	A	64	70	68	76	A	62	60	82	82	A	
	60	64	60	70	A	58	55	60	70	A	64	64	64	70	A	60	52	82	80	A	
	59	61	61	69	A	56	64	60	70	A	64	68	64	71	A	60	58	82	81	A	C
	60	63	60	68	A	58	70	60	68	A	66	74	64	72	A	60	70	82	80	A	
	58	61	61	66	AW	56	90	60	60	A	66	72	66	70	A	58	60	88	90	A	
	58	62	60	66	AE	56	60	60	68	A	64	66	66	64	A	60	60	83	80	A	
	58	63	61	67	AC	58	63	60	70	A	64	70	66	68	A	58	60	86	80	A	
	57	58	60	70	AC	59	64	60	68	A	66	68	64	74	A	62	60	84	85	A	C
	57	60	60	66	AC	59	64	59	70	A	66	66	66	72	A	62	60	86	80	A	
	57	62	61	60	AC	58	62	59	71	A	66	70	69	71	A	61	58	88	82	A	

The Operating Manuals for each school covered areas as follows:

- **Classroom Section**
  1) *Air handling systems*
     - Description
     - Air Supply Unit Controls
     - Day-Night Auto Switch
     - Fan Operation
     - Time Clock
     - Temperature Gauges
     - Daily and Weekly Logs
  2) *Room Thermostats*
     - Standard Room Thermostats
     - Day-Night Thermostats
     - Cooling Thermostats
  3) *Duct Heating Coils-Summer Operation*
  4) *Exhaust System*
  5) *Domestic Hot Water Heaters*
- **Gymnasium and Industrial Arts Section** (Items 1 - 5 are the same as section on Classrooms)
  6) *Kiln*

  Summary of Operating Procedures
  Daily Functions
  Weekly Functions
  Seasonal Functions

Energy Management — Quick Pay-Back on Minimal Investment

As presented by:
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A focus on Energy Management as practiced by the Mamaroneck School District

In May of 1977, the voters of the Mamaroneck Public School District

approved a capital expenditure of $581,500 for energy conservation projects. Included in this amount were such items as:

- Oil burner replacement: rotary cup burners were replaced with air atomizing burners.
- New boilers were installed in three elementary schools.
- Calibration of temperature control equipment.
- Replacement of leaking steam traps with new ones.
- Replacement of broken condensate lines.

This brought the physical plant into reasonable physical shape and set the stage for our energy management program.

The Program

The following program was implemented by this district and was under the control of the Buildings and Grounds office, with total support of the Chief School Administrator and the Board of Education:

1) Thermostats were reset as follows:
   - Sedentary Activity Spaces: temperatures in classrooms, study halls, libraries, conference rooms were set at 65°F (Day) and 50°F (Night).
   - Moderate Activity Spaces: temperatures in shops, art rooms and similar areas were set at 62°F (Day) and 50°F (Night).
   - Vigorous Activity Spaces: in gymnasiums, temperatures were set at 60°F (Day) and 50°F (Night).
2) Unit ventilators and window line heat kept unobstructed.
3) Turn off lights and exhaust fans in unoccupied spaces.
4) No adjustment of thermostats by building administrators, faculty, clerical or building custodians.
5) Terminate night activities by 10:00 p.m.
6) Keep windows and doors closed.
7) No night operation of boilers when outside temperature is above 45°F. Night cycle to start as early in the day as possible.
8) Reduce hot water temperatures to 105°F.
9) Complete shut-down on weekends and holidays, of all mechanical equipment when temperatures are not extreme.
10) Application of Federal and State guidelines for energy management to all buildings.

The Results

From 1977-1980 the following reductions were achieved:

Fuel oil in gallons:

1977-78	1978-79	1979-80	% Change	Gals. Saved
714,401	636,447	461,371	35.41%	253,030

Cost avoidance of $133,270 (Average price of 3 years — 52¢)
$202,424 (1979-80 average price — 80¢)

Electricity:

1977-78	1978-79	1979-80	% Change	KWH Saved
3,710,363 KWH	3,546,817 KWH	2,881,766 KWH	22.33%	828,597

Cost avoidance of $71,839 (Average price of .867¢ per KWH)
$91,145 (1979-80 price 11¢ per KWH)

The Future

Mamaroneck Schools will continue to pursue an aggressive management of fuel and electric costs. A bond issue, approved by the voters in May of 1980, contains approximately $5 million to increase the energy efficiency of our buildings (details are available upon request).

Energy Conservation Program of Schaumburg Elementary School District #54

As presented by:
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Our costs only rose 1/10 of 1% while utility price increases rose 15%! *Why?* We think it's because of our aggressive, on-going Preventive Maintenance Program which emphasizes energy saving measures.

Over the past two years, while utility companies have initiated price increases at an approximate rate of 15% (including the fuel adjustment factor), Schaumburg Elementary School District 54 in 1979-80 was able to restrain utility costs to a 1/10 of 1% increase over the 1978-79 budget allotment. This was done at the same time we expanded our facilities by 11 classrooms. The 1979 actual cost for gas and electrical services was $993,957.00 as compared to a 1980 cost of $999,641.00!

Here is a list of the steps we considered for improving energy efficiency and reducing long term energy costs:

Lighting

1) All exterior lighting at 31 sites was placed under control of time clocks which automatically shut off all lights at 2:00 a.m.
2) The District switched from incandescent lighting to high pressure sodium lighting in 19 gyms. The estimated payback of the $93,000 investment is expected to be 3.9 years.
3) Light levels in halls, stairwells and junior high school cafeterias were reduced but kept well within the levels required by safety.

Hot Water Heaters

1) One hundred and fifty (150) domestic hot water heater thermostats were lowered from 140° to 105° for elementary buildings from 150° to 110° for junior high schools.
2) Electric hot water heaters were turned off during the night and on weekends. Several hot water heaters were wrapped with insulation to improve heat retention.
3) Time clocks were added to the circulating pumps of 75 gas hot water heaters, resulting in overall energy conservation and prolonged pump life.
4) On large heater circulating pumps, flow switches were installed allowing a standby pump to be automatically turned on when the large pump fails to function, thus preventing building freeze-ups and reducing the need to operate two pumps continuously and simultaneously.

Heating/Air Conditioning Units

1) At the beginning of the heating season, building temperatures were placed under control of time clocks, triggering a night temperature set back by 10° at 3:30 p.m. and a return at 6:30 a.m.
2) All boilers and their burners were cleaned and adjusted at the beginning of the heating season to maintain efficiency.
3) Maintenance staffs closed all outside air vents or air-handlers and univents to 5% plus normal leakage.
4) The maintenance staff conducted an annual inspection and cleaned all roof-top air conditioning coils, which in some cases, produced a 15° increase in air cooling efficiency.
5) Time clocks were installed on all air conditioning units to activate automatic shut off for nights, weekends and holidays.
6) A water treatment program was initiated for all boilers to prevent scale buildup and calcium deposits, thereby improving heat transfer efficiency while extending overall boiler life.

Experimental Steps

1) The maintenance staff installed turbulators in two boilers which resulted in an estimated 15% improved boiler performance.

2) In replacing a boiler at the Schaumburg Elementary School, a new stack was installed which closes when the boiler shuts down. It is projected that this could provide a 10% heat savings efficiency.
3) Maintenance personnel installed Bermuda fans into two schools with extra high learning center ceilings. The result was improved overall air circulation and heat distribution.

Staff Training and Program Monitoring

1) The maintenance staff has participated in an on-going staff development program. This training has allowed them to learn the details of all of the District's energy conservation steps.
2) An aggressive, on-going Preventive Maintenance Program has been initiated throughout the District.
3) Principals are continually kept up to date as to what conservation steps are being conducted in their buildings and are asked to assist in the monitoring of the results.
4) Detailed records are maintained on all utility expenditures for each building. These records are then used to compare annual costs.
5) An energy savings program has been integrated into the Districts's K-8 curriculum.

Two and One-half Years of Computerized Energy Conservation

As presented by:
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In mid-'1976, the Portsmouth, Virginia School Board took a look at the cost to heat, cool and ventilate the city's 37 schools, and was shocked by what it saw. The figures were drastically over budget and, with impending utility increases and a new school on the drawing board, the future looked even more bleak. As a result, the board decided to research the feasibility of a computerized energy management program.

Eventually, a Honeywell Delta 1000 was purchased and installed. The system went on-line in September, 1977, controlling and duty cycling air handlers in the four Portsmouth schools with the highest electrical energy use.

The four are Manor Senior High and three junior high schools, Churchland, Mapp and Waters. They're tied into the energy management system located in the school system's maintenance office through the use of leased telephone lines. The four schools, located within the 29 square mile area of Portsmouth, were built between 1953 and 1971 and comprise a total of 613,328 square feet.

The energy management system in the school maintenance office is unmanned from 5:00 p.m. until 7:00 a.m. weekdays, and on weekends and holidays. All of the schools tied to the system have afternoon and evening activities. Manor High, the largest school with 1,200 students, also houses a public library, a community theater and a public gym. What this adds up to is a lot of extra hours used and a light bill alone that ran $10,000 to $15,000 a month.

The Honeywell system was designed with annunciator panels in each of the schools controlled by the Delta. That way principals can issue the authority to a day or night custodian to override the system if they feel that building conditions are not what they should be. Also, a principal can override an alarm condition. If that happens, we'll be in touch first thing the next morning to get it corrected. The principal is responsible for making sure the students in his building get a good education.

At Mapp Junior High last year however, there was cause for complaint. The school was cold in the winter and hot in the summer. The Delta system kept reporting that the conditions were not right; were not optimum. We couldn't find the problem, but the energy management system refused to let us just brush it off. Finally, a separate cooling coil was found in the air conditioning duct system. No plan showed it; no access panel led to it. Over the past five years or so the coil had become so plugged with sawdust and filings, it had reached a point where it was inefficient enough to just keep running continually. The greatest contribution the Delta system has made is that it's forced us to correct maintenance malfunctions such as bad thermostats, poor hot deck settings, etc.

Several Control Interpreter Language (CIL) programs have been written. A special Delta system option enables us to modify the existing software applications or to write entirely new control sequences.

One CIL program reports on the status of all the air handling units in the four schools, four times a day. This program was revised to instruct the Delta to go from on/off status to an analog program and therefore providing a hard copy report to record temperatures. This report gives the condition of the building day or night and records it on a printout on four adjustable settings.

Each morning, we evaluate the system, checking it carefully for alarms, temperature reading and so on. Then we roll up the strip printout, date it and store it for future reference. The CIL modification is a good tool if you're challenged by someone. You can easily come up with the hard copy proof of

space temperatures for any given area that has a sensor.

Savings achieved translates into a 1.14 year payback, or return on investment (ROI). As a matter of fact, the School Board paid off the five-year loan in one year.

The 21,000 pupil Portsmouth School District is considered to be one of the most progressive in the state of Virginia. The school system has received some publicity for its efforts in saving the city taxpayers excessive costs for energy. All of it has been favorable, and most of it has been in print. A local television station filmed our efforts for a news story but they wound up with just me on camera. There isn't much to see except the little blue Delta on the wall. It's just not a visual story.

By the same token, most of our staff and students are not aware such an ambitious program is going on. And that's really the way it should be.

Building Data

Four Public Schools:

Manor High: 1,251 students, built 1971, 261,665 sq. ft., includes Public Library, Little Theatre, Planetarium and other public activities, fully air conditioned, 2-375 HP Trane centrigugal chiller; 9-AHUs = 257-HP.

Churchland Jr. High: 966 students, built 1970, 136,937 sq. ft. 350 HP York centrifugal chiller; 6-AHUs = 187-HP.

A.J. Mapp Jr. High: 721 students, built 1966, 103,420 sq. ft. 200-HP Trane centrifugal chiller; 7-AHUs = 113-HP.

W.E. Waters Jr. High: 651 students, built 1966, 104,601 sq. ft. 300-HP Carrier centrifugal chiller; 6-AHUs = 128-HP.

Energy Use History

	(Before Delta 1000) 1976-77	77-78	78-79	79-80
Electricity	7,874,483 KWH	6,574,716 KWH	5,517,900 KWH	5,164,344
% Reduction from base year	—	15.5%	29.9%	34.4%
Fuel Oil & Gas	205,387 Gal.	143,316 Gal.	151,715 Gal.	126,961 Gal.
% Reduction from base year	—	30.2%	26.0%	38.2%

Energy Cost History

Actual Electricity	$245,770 $(0.0312/KWH)	$216,286 $(0.0329/KWH0	$175,389 $(0.0318/KWH0	$261,156 $(0.0505/KWH)
Actual Fuel Oil-Gas	$ 73,186 ($0.3118/Gal.#2)	$ 53,122 ($0.4348/Gal.#2)	$ 60,900 ($0.5256/Gal.#2)	$105,030 (0.8718/Gal.#2)
Savings—holding 76-77 quantities constant, multiplied by unit cost for each year less actual cost.		$68,216	$95,674	$181,617
Accumulated Savings	—	—	$163,890	$345,507

Degree Days

Heat	3819	3792	3482	3529
Cooling	1504	1801	1451	1564
	5323	5593	4953	5093

Computer Application

Honeywell Delta 1000 Energy Management System consisting of: operator's control console with keyboard; a central processor unit with 2,000 point capacity time oriented start-stop programs, electric demand load control and load shedding capability, event initiated commands, optimized start-stop programming, analog alarm limits, control point adjustments, load cycling; two data printers, including power consumption for each 30 minutes and 24 hour totals.

Computer Components

W1000A Central Processor Unit RAM for general processing and scanning-utilizing 16 bit micro-processor, capable of 40 typical computor instructions.

W1008 Transmission Power Supply w/22V.D.C. standby power, 4.8amp 120v AC., temperature 0-11F. 12-Universal Data Gathering panels with accessory device panels to interface between local mechanical, pneumatic, electrical and a coaxial cable transmission system.

2-W1002 Printer Modules; two column print exclusive of date and time; print rate of 2 lines per second; 3¼ inch wide paper roll; 21 character line, red for alarm and black print for normal.

W1001 Operator's Terminal; provides access to software programs, direct control of equipment, reporting of status or analog values.

4-W1003 Annunciator Modules; these 40 point display panels provides each building with the opportunity to over-ride the central processor.

93 points controlled or monitored in the four schools.

Equipment Cost

Purchase price from Honeywell, including programming: $109,369. Contractor installation cost: $30,000.

Local electric utility for meter pulse generating equipment: $4,105 plus $25/month.

Local telephone lease lines $135 initial plus $68/month.

Annual total maintenance contract, including programming and training $9.984/year.

If original 3¾% loan was held to full 60 months, interest: $174/month.

If increase in degree days considered, payback would have been 1.14 years on capital investment.

If degree days disregarded and all related cost included, payback was 2.02 years.

Section 2

Schoolhouse Energy Efficiency Demonstration

SEED: Things That Worked

As presented by:
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During the 1978-1979 school year Tenneco Inc., as a public service, conducted a Schoolhouse Energy Efficiency Demonstration (SEED). The goal of SEED is to assist schools in combating rising energy costs. Twenty demonstration energy audits were conducted by engineering and architectural consultants in schools located primarily in the Northeast and Midwest.

The results of the study, published in a report entitled "Something Special From SEED," indicated that a typical school's energy usage could be reduced by 48.6% through low-cost, quick-fix modifications. Most of these modifications can be paid out of the regular operating and maintenance budget, and have a two-year payback or less.

Following each audit, a detailed report and list of energy efficiency recommendations were submitted to the Superintendent. Many of the schools over the past year have been implementing SEED recommendations, along with others, with some very good results.

In Racine, Wisconsin as a result of the Starbuck Junior High audit, the district implemented the simplest recommendations in all of its schools:

- Weatherstripping doors
- Reducing the amount of air coming through unit ventilators
- Tuning the thermostat system
- Installing high efficiency fluorescent lamps and ballasts on a replacement basis

By doing these things and keeping a close watch on mechanical equipment, energy usage district-wide was reduced by 13% from the 1978-79 school year to the 1979-80 school year. Costs increased by 11%.

In Newark, Delaware at McVey Elementary School by implementing SEED recommendations, the district was able to reduce electric consumption by 15%, fuel oil consumption by 37% and natural gas consumption by 8%. Costs increased by 4%, 57% and 1% respectively.

More "things worked" to augment energy efficiency than these aforementioned quantifiable results. Public awareness proved to be a key element to school conservation.

Donald L. Mailho , Supervisor of School Plants in Pawtucket, Rhode, Island said "We have tried to enroll all parties that could help us succeed with energy awareness and conservative measures — PTAs, teachers, children and administrators. Maintenance personnel have been instructed through energy conferences, seminars and our own programs for energy conservation. Educational material has been distributed throughout our system and posted in all our buildings." In a five year period, Pawtucket school system has reduced energy consumption by 20%."

John Carnell, business manager of the Friends School in Baltimore, Maryland says "I think the most significant result of the SEED study is the awareness we now have about energy costs and conservation." Carnell states further that the "SEED study brought an additional benefit which cannot be measured in dollars and cents: the educational value derived by students and faculty from preparing for the audit."

SEED is building upon the educational benefits of energy efficiency by developing a program for teachers and students. This program is entitled "Something Special for Teachers" and assists teachers in using the school facility to teach energy, its consumption and its conservation.

Schoolhouse Energy Efficiency Demonstration

The SEED program is an effort to help schools ease their energy budget problems. Operating on fixed incomes, many schools must use funds originally earmarked for education to meet rising energy costs. Schools can combat the problem, in part, by utilizing energy efficiently. Studies have shown that the typical American school can reduce energy use by up to 25% without major capital expenditures. SEED is helping schools discover, in tangible ways, how this can be achieved.

During its first year of operation, energy audits at 20 schools were conducted. Independent consultants retained by Tenneco conducted the audits, analyzing energy consumption in each of the demonstration schools. The audits revealed opportunities for reduction of energy use, through low-cost-modifications and changes in operating procedure.

SEED also includes a film on the subject of energy efficiency and cost-avoidance for schools.

For additional information or to order the SEED film and/or SEED Publications, contact Tenneco's Public Affairs Department.

Racine Unified School District Energy Conservation Program

As presented by:
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The Racine Unified School District has been engaged in an energy conservation program for the last three years. This program has been successful in reducing the district's use of natural gas by 13%.

Following is a list of things that were done to achieve this savings:

1) Energy audits were conducted on four schools. By picking certain schools according to age and type, we were able to use the recommendations in these audits on the 40 other schools in the district.
2) Each school was equipped with electric seven-day timers on all fan controls. Timers were set so the fans would start one hour after the beginning of the school day and turned off one hour before the school day ended.
3) All temperatures were lowered to comply with the federal regulations.
4) Every thermostat and control device in the district is checked on a continuous basis to make sure they are calibrated correctly.
5) Skylights have been eliminated and/or covered over. This has reduced vandalism, leaks and heat loss.
6) The amount of outside air taken into the building has been reduced to about 10% of design in most cases.
7) Weatherstripping has been installed on outside doors. Vestibules were built in some areas to decrease the amount of cold air entering the building.
8) Windows have been covered or eliminated in areas where there was a large amount of glass. This was done primarily to reduce the amount of heat buildup during spring and fall, and to reduce the heat loss in the winter. This also reduced the replacement of broken windows. (Windows have been covered in a couple of different ways. The method used in each case depended on window design.)
9) All fluorescent bulbs and ballasts purchased for replacement are of the energy-saving type.

Projects which will be undertaken as financing becomes available include these:

1) Continue covering windows.
2) Install insulation in attics, or as roofs are replaced.
3) Lower ceilings and lights.
4) Decrease amount of foot-candles in some classrooms.
5) Investigate automatic computer building control systems.

The district was fortunate to participate in the Schoolhouse Energy Efficiency Demonstration (SEED) program conducted by Tenneco, Incorporated. Recommendations made by that program, along with conservation methods undertaken prior to the survey, have been enumerated above.

At one location there was a series of windows which were made like storm windows, and fastened with a quarter-round. A 1¾-inch insulated panel, which had aluminum on each side, was purchased. The window was removed and the panel installed in its place. After the panel was installed, it was painted to match the building. All windows in each classroom were covered in this manner, except for three small operable windows, which provided for outside ventilation.

In a number of locations, buildings had very large wooden sash windows; these windows were all operable. At these locations, windows were screwed shut, with the exception of two per classroom, and caulked around the sash. On the inside, a ¾-inch layer of styrofoam was fitted into the sash next to the glass; this styrofoam was then covered with a ¼-inch layer of plywood or masonite. On the outside, a ¾-inch layer of overlay plywood was installed and caulked. The inside masonite was painted the same color as the walls, and the exterior the same color as the trim. Where buildings were two or three stories high, a truck with a bucket was rented so that carpenters could install panels without using scaffolding. Panels were cut to size before installation.

The Fourth R — Resourcefulness in School Energy Conservation

As presented by:
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Do you have a building constructed in the late 60s or early 70s? Let's make that building more energy efficient. (It might work for those new buildings too!)

The Garland ISD is a school district composed of 44 campuses with an enrollment of 30,000 students. Based on a pilot project conducted by Tenneco, recommendations were presented noting methods available to increase energy efficiency, especially in buildings built in times when energy consumption was not of primary importance. The recommendations were based on a low payout and most improvements could be done within a single year. Following is a list of activities the Garland ISD has been conducting in response to these studies. The figures below are based on one school with nine A/C units providing 117.5 tons of air conditioning:

No.	Description	Cost of Implementation	Annual Savings Based on 1978 Price and Utility Rates
1.	Change to softer lighting A/C load decrease minus heating load increase	$ 703.00	$1,473.00
2.	Partition plenum	20.00	200.00
3.	Seal plenum	150.00	600.00
4.	Reduce compressor tonnage rating		300.00
5.	Use high EER compressor (cost is for 3 compressors)	2,100.00	1,000.00
6.	Turn off heaters at night		1,800.00
7.	Insulate water heaters	40.00	72.00
8.	Seal economizer	50.00	300.00
9.	Windbreak	1,200.00	200.00
10.	Reset refrig.		100.00
	TOTALS	$4,263.00	$7,645.00

Lighting: Use lower wattage fluorescent lamps utilizing school quantity discount when buying in large quantity. In fixtures with four lamps, remove two lamps per fixture and disconnect corresponding ballasts, e.g., corridors. Alternate removal of lamps from left and right banks is suggested. In two lamp fixtures, remove lamp and disconnect ballasts for every third fixture. Note: You may reduce the total lumens/sq. ft. by 10%; however, you will increase usable lumens/sq. ft. by 15% while reducing eyestrain.

Partition Plenum: Seal off portion of plenum so to provide chilled air to offices in use, such as administration office in summer but not classrooms if not in use. Temporary partitions can be constructed with a life of one year by using polyethylene film and duct tape.

Sealing Plenum: The most desired method is to line plenum with polyethylene film and duct tape leaving cutouts where necessary for access to chilling units. Corridor areas were found to be cold while temperatures at air returns had a variation of as much as 18°. Note: Upgrading the thermal integrity of the plenum would assist in decreasing the air conditioning load of the school by reducing the temperature differential between the plenum and the corridor.

Reduce Compressor Tonnage Capacity: This is recommended as compressor units fail. Due to the previously discussed procedures, an air conditioning load decrease of 20% can be realized. Reduced compressor size would also cause increased efficiency because the evaporator and condenser subsystems would tend to be oversized, creating longer cycle intervals.

Use Higher EER Compressors: Higher EER compressors use approximately 40% less energy.

Turn Heater Completely Off During Evening Hours: Option A—Manually shut off each independent heating unit during non-use periods at switch provided for this purpose. *Option B*—Modify heating units to include an automatic timing device in series with the switch. Timer should have defeat capability. Note: Units should be turned *off* not down.

Insulate Water Heater: Insulate storage tanks with 8" of fiberglass insulation or equivalent.

Seal Air Conditioning Economizers: The most economically feasible method is to seal off economizer with polyethylene and duct tape during December, January and February. The economizer damper should be functioning properly.

Windbreaks on NW Side of Building Mass: We employed the use of landscaping materials to act as a buffer to prevailing northwest winds. Coniferous trees such as evergreen or spruce varieties were successful here.

Reset Refrigerator Thermostats to Highest Temperatures During Summer Non-use Period: Reset thermostats to highest temperature settings during non-use period of one week or more. Do not cut unit completely off.

Section 3

Energy Conservation Ideas and Resources

Reducing Energy and Vandalism by Total Blackout

As presented by:
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In October 1978 a pilot program to reduce vandalism was initiated in 14 Carleton Board of Education schools. The purpose of the program was to monitor the effect that total blackout of the interiors and exteriors would have on energy usage and vandalism.

The results of a survey conducted in June 1979, among building superintendents and principals are as follows:

Question	No	No Change Apparent	Yes	No Answer
1. Have you had less glass breakage overnight?	2		11	1
2. Has the replacement of night light bulbs been reduced because of breakage?	1	1	11	1
3. Has window breakage overnight been reduced?			13	1
4. Do you feel there has been a reduction in vandalism after nightfall?		14		
5. Comments were as follows:				

- Good idea.
- Not as many people hanging around school.
- A cooperative effort between the school and community would strengthen the program.
- Use less lightbulbs.
- No damage at school for four months.
- Less activity around school. Also we are saving energy.
- More roof damage. (Time not specified - day or night.)
- Vandalism is reduced but not the number of break-ins (no change).
- Devise a monthly vandalism form.
- It has worked very good.
- I think this program should keep going.
- Removal of door handles from exit doors during the summer would help to eliminate break-ins.
- Black out working very good.
- No comment made.

The pilot program is considered to have been very successful. It reduced vandalism; reduced costs due to window and lamp breakage; and reduced energy consumption and costs.

Following a review of the foregoing, in September 1979, the Board approved the total blackout of the exterior and interior of all facilities.

Statistic Comparisons

	Incidents		
	1978	1979	1980 (6 months)
Daytime	128	232	207
Evening	69	198	84*
Weekend	38	87	103
Unknown	35	11	3
Nighttime (after blackout)	35	14	* Combined
Glass breakage	274	267	131
Exterior lamp breakage	188	86	40

It is noted that while incidents for fire, loss, theft and vandalism are increasing rapidly each year, nighttime (after blackout) glass and lamp breakage incidents and costs have been reduced.

Energy savings have not been calculated as of this date.

It can be appreciated, however, that if all interior, exterior and parking lot lighting is blacked out immediately after use in a school system, the consumption and related costs would be substantially reduced.

The total blackout of schools is put forward as an area for analysis for a school district. It is not suggested that such a program would be successful in all districts.

Gas Conversion — Window Insulation

As presented by:
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"Energy—

The greatest domestic crisis our nation will face in our lifetime."

—President Jimmy Carter

Inexpensive costs and abundance of fuels can no longer dictate our comfort. Rather, we must begin immediately to take the most effective steps to reduce our energy consumption and waste. Various products and systems are available to us today to assist in the challenge to survive.

Most school districts are aware that the cost of energy has risen drastically in recent years. Based on present trends and forecasts, the rates are expected to double in the next four years. Many school districts have already set up programs to help combat the crisis and have taken the obvious steps to control their use of energy. This however, is a real challenge.

Unpredictable Energy Budget — Fluctuating energy demands by your buildings, coupled with constantly increasing electric utility costs can lead to some staggering monthly energy bills.

Insulating school house windows and converting oil-fired burners to natural gas can result in significant savings. Consider these points:

- Are your employees informed about conservation methods? If not, they should be.
- Train all maintenance and operation individuals to save energy by in-service sessions.
- Begin projects of insulating windows and roofs immediately. The payback period is, in most cases, two and a half to three years.
- Convert oil burners to natural gas and save 30%.

Energy Incentive — Sampling

As presented by:
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Palos District 118 initiated what it feels is an effective means of combating energy waste. The program is not faultless and is variable at times, but the basic formula is sound. With the basic formula and some imagination, simplified plans could result in a tailor-made energy incentive program for any school district.

The incentive plan is based on using less kilowatt hours and therms with disregard to the utility costs the rationale being that an energy consumer has no direct or indirect control nor input into the fuel adjustment factor or management formula used by the utility companies.

Simply stated, our energy incentive concept is to provide a conduit to transfer dollars to the district educational fund for consumables, supplies, textbooks, equipment and the like; items not requiring a reoccurring fixed expenditure. Therefore, funds normally budgeted for utility costs could provide a means of supplementing the per pupil allocation with monies saved through the energy conservation plan (use of these funds are under the full discretion of the respective building principal).

It is further felt that as energy consumption is reduced, utility costs to the district could continue to rise, based on fuel available and foreign dependency. On the other hand, school districts throughout the nation would be supporting an even greater objective of making this country more self-reliant and less dependent on foreign energy sources.

The life expectancy of this type of energy incentive program is three to four years. At that point, a new stimulus would need to be explored. One suggestion is that a review of the incentive plan be made to formulate an award criteria based on maintaining levels of achievement.

With board endorsement, Palos District 118 implemented its energy incentive plan in 1977. We called our program *"Operation Thrust—Energy Conservation"*. The program's goal was to reduce overall energy use by three to five percent.

A word of caution. . .whatever type of incentive program you develop, it's success is dependent on full involvement of all persons in the building, teachers, students, parents, support personnel and others — *"Teamwork"*.

Develop an energy checklist with staff involvement; do a mini-walkthrough survey; set realistic priorities. It is important that a building be checked during off-hours to assure that automatic flush valves, exhaust fan motors and other equipment are either on *off* or on a *night set-back* or cycle where provided. It is a good idea to have a noninterested party's observation.

"Operation Thrust" has not required major out-of-pocket expense as District 118 coupled its thrust to *"dial down"*, elimination of careless practices and a preventive maintenance program. Larger institutions have installed sophisticated monitoring equipment. Since our buildings range from 60,000 to 80,000 square feet, we have found that a simple 24-hour time clock, operating through a relay in the breaker box, is adequate.

We not only achieved energy savings, but received an indirect benefit from the preventive maintenance program that was developed.

School districts must look at energy costs as fact not fiction. An analysis of the utility costs in your own budget can prove alarming.

SCHOOL SAMPLING

	Gas Used			Electricity Used	
Year	Days	Therms		Days	Kilowatt Hours
1977-78	299	66,236.41		307	369,178
1978-79	299	56,635.46		307	317,473
Therms Saved...		9,600.95	*Kilowatt Hours Saved*		51,705

NOTE: We used 299 and 307 days. Time Span may be adjusted to meet your plan.

The average cost per therm in 1977 was 21¢, resulting in a savings of $2,016 in gas use. Using the average therm cost for 1978 of 24¢, the savings would be adjusted to $2,304.

The average kilowatt hour cost was 4¢ in 1977, resulting in savings of $2,068. Using the average kilowatt hour cost in 1978 of 5¢, the savings would be adjusted to $2,585.

The incentive plan's combined credit (at the 1977 rates) for gas and electricity use in 1978, resulted in a savings of $4,084, which was credited to the respective school.

(Although not implemented, kilowatt hours/therms, times the rate, divided by square feet, could be used to arrive at square feet in building comparisons.)

Examples to Realize Energy Savings At Little or No Cost

- Determine degree range.
- Dial down.
- Corridor lighting (not Emergency Lights)
- Weatherstrip.
- Cover windows, time and length of period.

- Use night setback, time and length of season.
- Tie flush valves to light switch.
- Check unoccupied space, etc. for energy use.

Steps to Achieve an "Energy Thrust"

- Do a periodic mini-walkthrough.
- Make off-hour inspections.
- Integrate into curriculum.
- Explore ideas with staff.
- Establish an energy checklist with ideas from staff, students and parents — make it a challenge to expand the basic checklist.
- Adopt surcharge for building use on weekends, days school is not in session, during heating season and if air conditioning is a factor, same would apply.
- Avail yourself to ideas and materials supplied by vendors, state and local authorities to your advantage.
- Use an incentive thrust, provide a monthly analysis of utility bills for comparison.

An energy incentive sampling can only improve the environment and provide rewards to the students and teachers. The rewards would be in the nature of educational gains, which otherwise may not have been achieved. Instead of sending energy dollars up the chimney in smoke, the incentive thrust has captured this energy and converted the savings to a more satisfactory alternate, educational materials and supplies.

Energy Unit Budgeting

As presented by:
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Good accounting and managerial practices usually call for two items of information when developing a budget. *How many* and *how much*. For some unknown reason, energy costs are quite frequently prepared without any requirement that the *how many* aspect be known. In other cases, when *how many* is made known, no attempt, is made to insure that the *how many* is the

minimum amount necessary to provide needed service.

Establishing *how many* is the key to effective forecasting of energy expenditures. As with other resources, management is effected by controlling the number of units involved. Knowing this vital fact will go a long way towards demystifying the problem of run-away energy costs.

Run-away energy costs is the term used to describe the steep rise in energy expenditures. Though the cause is mainly increased prices, it can also be related to increased usage. Increased usage can be: the result of the planned increase in service; the result of temperature variation; or the result of deterioration of energy management practices. Determining and quantifying the underlying cause of increased usage is possible only by comparison with an *Energy Unit Budget.*

The analysis of decreased usage poses the same question. Is it the result of a cutback in services? Is it the result of weather variations? Is it the result of improved energy management? These questions can be answered sensibly only by reference to an *Energy Unit Budget.*

A *District Energy Unit Budget* can only be built from the *Energy Unit Budgets* of the individual buildings in that district. At the beginning of the program, historical usage should be accepted at face value. A reduction goal should be established. Weather variations should be allowed for by using a heating degree day value that is approximately five percent higher than a running 30 year average.

Using these factors, an *Energy Using Budget* can be built. Base year information for the building shows 1,000,000 KWH usage and 50,000 gallons of oil. Heating degree days in the Base Year were 5725. The 30 year standard heating degree day figure is 4,890. 5,200 heating degree days is selected as the Energy Budget standard. The established reduction goal is 15%.

For electrical usage, weather variation can be ignored if the facility is not air conditioned. (If air conditioned, there must be an energy budget established for the cooling load). 100,000 KW base year usage −15% mandated reduction results in an Energy Budget of 850,000 KWH. Oil usage in the base year is adjusted by the variance between Base Year Heating Degree Day and Energy Budget Heating Degree Day and then reduced by 15% to give the budget figures. 50,000 x 5,200 ÷ 5725 - 15% mandated reduction results in an Energy Budget of 38,603 gallons. These two figures give the manager his *Energy Unit Budget.* Price extensions can be made to get the dollars needed *but* the *Energy Unit Budget* will remain constant from year to year. It can be adjusted as expansion, change in function, and *Improvement in Energy Management* dictate.

Any and every program can benefit from capitalizing on the Federal Emergency Building Temperature Restrictions Program. Remember the number 248, 78° for cooling, 65° for heating and 105° for domestic hot water.

Energy budgeting by commodity units is the logical follow-on to any effective energy conservation program. Once maintenance and operating improvements have reduced the amount of energy use in a particular building, it's time to start budgeting by consumption by units of energy rather then by dollars of energy expenditure. Base year consumption is reduced by

the stated energy goal to give budgeted energy consumption for the upcoming budget period. For heating fuels, an additional step related to heating degree days will provide a standard against which performance can be measured and dollars can be programmed.

Once an energy unit budget has been established for a building or group of buildings, a variable in the equation concerning energy expenditures for future periods is eliminated. Changes in energy costs can be easily accommodated by a simple device of recalculating based upon the new energy price. Changes in weather and their effect on heating fuel consumption are quantified and can be easily explained and understood by all persons concerned.

This use of commodity budgeting will help wring the last five to ten percent of energy fat out of an operating budget.

This description tells how-to-do-it.

Keeping Score

(Computerized Energy Usage Monitoring Program)

As presented by:
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One of the most important issues in public administration today is the management and control of our declining energy resources and skyrocketing energy costs. Fuel and utility bills that were once simply paid, must be closely scrutinized, as part of a comprehensive public energy management program.

A successful energy management program depends on the implementation of a systematic, uncomplicated, energy scorekeeping program to gather and maintain accurate up-to-date records of building energy efficiency. A school district's energy scorekeeping program should generate timely management reports without adding significantly to staff work loads or administrative costs. An energy scorekeeping program should relieve the Energy Conservation Manager from tedious hours of paperwork, and enable him to spend more time checking areas of concern. An energy scorekeeping program should be designed to help buildings become energy efficient by:

- Providing management with a system of energy accounting by building and by system, determining building energy efficiency and setting

energy conservation goals and objectives.

- Monitoring changes in energy usage resulting from no cost-low cost and capital improvement energy conservation activity.
- Comparing building energy efficiency trends year to year.
- Scrutinizing energy bills for meter reading errors or short deliveries.
- Establishing a competitive energy conservation spirit between individual building managers by providing feeback on monthly usage.
- Forecasting energy budgets.
- Completing State and Federal energy grant proposals and applications.
- Freeing your Energy Conservation Manager to manage energy instead of becoming an energy bookkeeper.

The MASBO CO/OP Computerized Energy Recordkeeping Program, *Keeping Score*, is designed to accomplish these goals.

First, all past data is compiled into a data base of historic energy usage file, and summary reports, displaying salient information on past energy consumption are generated. Second, a continuing series of Energy Management Reports is provided. Meaningful comparisons of energy usage can then be made, and the results of energy conservation steps can be measured and evaluated. Participating school districts need only forward a simple form on which data from monthly bills and readings has been entered. Energy usage is then computed, and computer printouts are forwarded to each school district.

The standard management reports currently produced show:

1) Percentage energy use, by month for all fuel types:
   - Energy type, building and system summary.
   - Unit usage, and percentage usage by month.
   - Cost and percentage cost by month.
2) Energy usage by building, and by total system:
   - This month and year-to-date.
   - By MBTU and by total energy expenditures.
3) Energy usage by month:
   - By building and by total system.
   - This year, last year and difference, by MBTU, and by cost.
4) Building and system energy efficiency report:
   - Ranked "Most Efficient" to "Least Efficient".
   - MBTU per square foot and MBTU per student.
   - Energy dollars per square foot and energy dollars per student.
5) Building Energy Management Report:
   - Electric, oil and gas units this year, last year and difference.
   - Electric, oil and gas dollars, this year, last year and difference.
   - Year-to-date, energy statistics including:

     KWH/Sq. Ft. and $/KWH
     Gal/Sq. Ft. and $/Gal
     CCF/Sq. Ft. and $/CCF
     MBTU/Degree Day
     $/Sq. Ft.

Following Up On Your Energy Management Program

As presented by:
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The objectives of energy management follow-up are attempts to eliminate the laxity that creeps into a program of long duration. This is especially true because energy management is first and foremost a people problem. If this aspect of the program is not dealt with successfully, no real energy savings can be accomplished. Some points of consideration for an energy manager follow:

1) Goal setting - system wide.
2) Goal setting for each school.
3) Establish a school energy committee.
4) Educate the committee and the school about:
   - Conservation as a viable energy resource;
   - Conservation as an inflation fighter; and
   - Conservation as a tool to create jobs locally - a recession fighter.
5) Establish a data base for each school:
   - Convert energy to BTUs;
   - Tabulate, per school, per square foot, per cubic foot, per student;
   - Additional factors such as length of day, adult programs and others may be considered;
   - Share the information with the schools.
6) Periodically review the comparison of actual usage of energy with predicted usage.
7) Establish a feeling of pride in the schools' accomplishments.
8) Publicize good efforts and results.
9) Continually compare data to:
   - Try to improve the conservation performance
   - Determine which programs are most productive
   - Note any deterioration in results at an early stage

Remember, money wasted on energy cannot be expended on salaries, equipment, or other educational needs.

Utilization of an Energy Conservation Computer

As presented by:
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During the past several years, a savings in energy has been realized through conservation methods and the utilization of System 7. Some comparative information follows:

Electrical (kilowatt) Savings:

Kilowatts Used

1972-73	1978-79	1979-80
6,521,292	6,084,642	
	3,851,293 (To Feb. 1979)	3,594,865 (To Feb. 1980)

Usage of kilowatt hours from 1972-73 to 1978-79 has decreased by 436,650 kilowatt hours.

Usage of kilowatt hours from June through January, 1978-79 to 1979-80 has decreased by 256,428 kilowatt hours.

Therms Savings

Therms Used	1974-75	1978-79	1979-80
	723,605	1,019,250	
		501,862 (Jan. 1979)	415,798 (Jan. 1980)

Usage of therms from 1974-75 to 1978-79 has increased by 203,276 therms.

For the period of June through January for 1978-79 to 1979-80 therms has decreased by 86,064 therms.

As well as kilowatt hours and therms savings there has been a dollar savings experienced during the months of January and February (West High School only) as follows:

Energy Conservation Program

Leyden High Schools

LOCATION	East: Franklin Park	West: Northlake
Constructed	1924	1959
Additions	7	1
Sq. Footage	445,087	400,154
Material	Brick/Masonry	Metal Curtain/Glass
Students	2141	1610
Staff	450 DISTRICT	

Need for conservation and savings too!

What is controlled?

- Air Handling Units
- Air Conditioning Units

Heating systems are gas-fired, low-pressure steam boiler. Air conditioning units vary from 5 tons to 60 ton units with a total of 230 tons of A/C in the district.

How does it control?

- Energy conservation computer system
- Computer systematically shuts down units periodically
- Schedules vary according to different days and requirements

Example of a typical day: Before 4:00 p.m. units shut down six minutes every half hour. After 4:30 p.m., shut down is 15 minutes every half hour. At 9:00 p.m. all fans shut down (unless school function is taking place). At 5:00 a.m. cycle will start again.

Why energy conservation system?

1) Savings of energy
2) Savings of dollars

Kilowatt Consumption

Year	Total	Difference	Percent
1974-75*	$6,146,732		
1975-76**	6,027,537	-119,195	-1.94%
1976-77***	6,188,602	+161,065	+2.67%
1977-78****	5,941,732	-246,910	-3.98%
1978-79*****	6,084,642	+142,910	+2.40%
1979-80	5,558,142	-526,500	-8.65%

* Prior to Installation of System 7 Computer
** Installation of System 7
*** Auto Shop Not Fully Controlled by System 7 (19,000+ sq. ft.)
**** Auto Shop Controlled by System 7
***** Severe Winter

Since 1974-75 the kilowatts consumed has decreased by 588,590 kilowatt hours to the 1979-80 consumption of 5,558,142 kwh. This represents a 9.57%

decrease. During this period, winters have been severe. Square footage has increased by 10% and costs for electricity have continually risen.

Residual savings have been obtained in natural gas consumption.

Savings of Dollars

During Rental Period	1975-1977
Gross Savings	$37,830
Rental Costs	24,456
Telephone Lines	2,400
Net Savings	$10,974
Since Purchase	1977-1980
Gross Savings	$68,031
Maintenance Costs	7,500
Telephone Lines	3,600
Net Savings	$56.931

Total measurable net savings for 1975-1980 = $67,905

What else can system be used for?

- Control all univent heaters
- Field house lights (large wattage)
- Parking lot lights
- Bell schedule
- Door locks
- Hall lighting
- Preventative maintenance
- Monitoring of units-on/off

EEAC Provides Energy Focus

As presented by:

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The Energy and Education Action Center (EEAC), established by the U.S. Office of Education in collaboration with the Federal Interagency Committee

on Education, serves as the point of focus for a Federal Government educational response to the challenges confronting schools and colleges created by emerging energy realities.

The general mission of the Center is to promote all phases of energy education-related activities on an interagency basis by drawing upon all relevant Federal, State and local resources to assist educational clientele in implementing energy plans.

Objectives of the EEAC are:

- To provide technical assistance and information to schools, post-secondary and other educational institutions, in order to encourage and promote energy conservation in educational facilities.
- To assist and encourage the development or adoption, identification and dissemination of supplementary curricular materials in order to increase awareness and understanding of the multi-disciplinary nature of energy, environment and engagement.
- To encourage and support the inservice training of teachers, administrators and other members of the education community in areas dealing with energy awareness and understanding, conservation, environment and engagement.
- To identify and support programs in career and vocational education which address energy related employment opportunities.

The major activities of the Center are geared to:

1) assisting current or potential grantees in becoming better informed about sources of federal funds for energy-related activities supportable under existing authorities;

2) increasing clientele awareness of the availability of products resulting from previously funded federal efforts;

3) establishing a reliable data base for conservation-focused facility and curriculum needs; and

4) assisting educators in developing strategies to increase public awareness of the importance and priority of energy and education needs in schools and colleges.

The Center's functional activities include the following:

- Coordinates Federal agency efforts and activities in the area of energy and education and energy conservation to assist State, local and other educational agencies. Such coordination is facilitated through the Federal Interagency Committee on Education (FICE) which includes the U.S. Department of Education, Department of Energy, Department of Transportation, Department of Housing and Urban Development and other Federal agencies as appropriate.
- Serves as an information center and data distribution network to provide data concerning energy and education materials, conservation measures and other relevant information.
- Serves as facilitator of technical assistance by providing access to: Federally-employed specialists in energy fields, who would be available to assist clientele; university and professional personnel, employed on a roving "expert" basis for serving as volunteer specialists; and groups of

volunteers assisting agencies in various research and application tasks.

- Administers a Resource Materials Center to exhibit materials, simulators, games and other education activities.
- Conducts training programs involving Federal, state and local staff, and university and professional personnel. Examples include Federally-sponsored training of local staff; training of Federal staff; training assistance to locals, packaging of training resources; technical assistance; training clearing-houses.
- Maintains access to a core of personnel designated by or detailed from each participating agency so that the inter-programmatic aspects of the program thrust are appropriately coordinated.
- Administers a personnel exchange program operating under the presently available authority of the Intergovernmental Personnel Act in order to increase the availability of Federal staff to clients and of client agency staff to Federal agencies.
- Supports the development of model preservice and in-service training programs and projects for new Energy and Environmental professionals, and assists in developing educational media programs for general public awareness in energy conservation and in the nature of current and future energy realities.
- Provides leadership and support in the development of new energy conservation supplemental curriculum materials focusing on the interrelationship of Energy, Environment and Engagement.

School Transportation Conservation and Contingency Plan

Prepared by
The National School Transportation Association Energy Committee

As presented by:
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Foreword

The private school transportation industry of the United States can point

proudly to a distinguished record of unselfish public service, flexibility in meeting public needs and farsighted vision in anticipating challenges facing both the industry and society at large.

As the nation faces a serious shortfall in motor fuels, both gasoline and diesel, all of the country's transporation systems and most major social institutions can be expected to undergo a wide range of modifications. Certainly the present situation and virtually all of the predictable developments of the future will affect school transportation as we now know it.

Not only does the energy situation combine with inflation and other economic pressures to mandate the utmost in conservation of energy and other resources to allow the school transportation industry to maintain its primary mission of transportation of school pupils, but also to test the flexibility and resourcefulness of the industry to provide additional service to society.

The 391,000 school buses — the largest fleet of like vehicles of all the nation's transportation systems — will, at some point of the shortage or at various shortfall levels, be vital to broader community service.

This document is developed for private operators so that they can prepare intelligently now for the challenges of the future.

This document was prepared by the Energy Committee of the National School Transportation Association. In preparing the material included in the following pages, the committee drew upon material previously presented by various private and public organizations and agencies. Special acknowledgement is accorded to the American Public Transit Association's energy planning publication, from which numerous suggestions have been adapted for dissemination to the school transportation industry.

Similarly, the material presented herein is intended for the public domain and as such is available to all segments of American society in the national interest.

NSTA Energy Committee
Washington, D.C. January, 1980

Introduction

Barring some unforeseen and virtually miraculous solution to the world's present energy situation, such as he discovery of vast fossil fuel deposits or the development of a cheap synthetic energy source, it appears clear that Americans will have to modify present transportation systems. A primary factor in such modification will be sharply curtailed use of, and dependence upon, the private automobile.

Based upon the best information available today, the world's energy picture presents a problem of a very long-lasting nature. Whether Americans and American government will adapt to this situation voluntarily or involuntarily remains to be seen, but it seems indisputable that both serious energy conservation measures and the maximizing of presently available transporation modalities will be inevitable.

While the first obligation of the school transportation industry is the safe

transportation of children to and from school and school activities, due to the shortage of fuel school buses will be necessary for broader community service.

As the nation adjusts to these new transportation circumstances, it will be necessary for each locality to provide for the mobility of its citizens. The development of energy contingency plans is an essential first step.

In approaching the following discussion it is imperative to realize that planning for future transportation needs cannot be addressed in a compartmentalized fashion. It is an assumption at the outset that comprehensive solutions — the only sort acceptable for such a pervasive problem — must involve many elements of society in general, and the transportation community in particular. It is therefore understood that only an approach which integrates all transportation providers will deal with the problem adequately.

Energy Contingency Plans

Energy contingency plans are designed to prepare for both immediate and long-range dependence on multi-passenger vehicles which will result in overall petroleum savings. Most commonly, energy contingency planning addresses the need to increase the capacity of local bus transportation systems, while at the same time prescribing and encouraging methods of spreading out — or apportioning in a more uniform way across a longer time frame — travel demand as well as encouraging greater acceptance and utilization of taxis, vans and informal multi-passenger travel modes.

Chief elements in planning of this sort are both the process and the end-product. The process describes the way in which plans are developed, identifies the participants and assigns responsibilities. The product is a listing of actual actions to be implemented. Moreover, energy contingency plans are generally keyed to levels of crisis; suggesting which actions are most appropriate at given levels of fuel shortage.

In developing this document it has been recognized from the start that while most communities have no transit systems and many have no rail or intercity bus systems, virtually all have school transportation systems and therefore, school buses.

Faced with increasingly scarce and expensive fuel, energy contingency planning can assure the community of the continued mobility of its population in order to maintain public welfare, economic vitality, the delivery of public services, the quality of life and emergency preparedness.

The school bus operator may find that energy contingency planning presents additional opportunities. The curtailment of private automobile travel, whether as a matter of personal choice, economic necessity, or government intervention, will result in an increased demand for public transportation which will provide the transit operator with a means to market the convenience of bus services to new passengers. In turn, this will lead to the retention of that new ridership if or when conditions ease.

At the same time, the increased demand for mass transportation services can be expected to lead to opportunities for additional utilization of school buses. Such usage may take the form of a high-use, short lead time, crisis

situation; or if properly anticipated and planned for, a smooth extension of present school bus utilization despite the high level of usage which might be required in the event of a widespread oil embargo or other climactic international incident.

Contingency planning can be expected to relieve the stress of a crisis mentality and help to build support for bus service among local officials and citizens. Should such support materialize, there would be the residual opportunity for continued use of school transportation vehicles in an ancillary capacity to other transit systems long after the crisis — of whatever degree and duration — has waned.

This would also bring the adult, non-school, population into immediate contact with the school transportation industry providing the opportunity for invaluable public awareness regarding the skills of school bus operators and the safety, design and maintenance of school buses.

As suggested above, energy contingency planning may become the cornerstone of an integrated transportation management system linking urban development and air quality into one comprehensive local transportation response.

The Role of the Bus Operator

For bus operators, three categories of action are important. First, through the redeployment of resources and revisions in traditional thinking patterns about the school bus enterprise, there are those actions that can be planned and implemented by the operator without outside assistance. Second, there are actions that involve the cooperation of other agencies. Finally, those actions such as parking bans, staggered work hours and similar governmental interventions which do not directly involve the bus operator but will have an important impact on operations.

Energy contingency planning challenges the local community to adjust its transportation components so that the entire system performs at its maximum level of efficiency. This goal also challenges transportation providers to see themselves as parts of a total transportation team rather than an isolated system operating in a vacuum.

Consistent with this goal and the cooperative role, but operators may find themselves taking on several or all of the following specific, task-oriented roles.

1) The operator is a *service provider*, managing the network to accommodate increased demand and attempting to attract those who travel on less fuel efficient modes. While providing school transportation services specifically and primarily, the school bus operator must also, as a transportation professional, provide first, expertise and second, non-school transportation services as an opportunity for economic growth while providing crucial public service.
2) The bus operator needs to be a *fuel conserver*. A fuel management plan is essential to address operations with maximum fuel economy as well as storage and supply issues.

3) In some cases the operator may be a *service coordinator*. This refers to the operator's role in linking conventional school bus operations with those of other service providers in the area.
4) Finally, but operators have taken, and must continue to take, the responsibility of a *planning instigator*. In this role the operator alerts public agencies, other transportation providers, the local business community and the general public to the seriousness of the local energy situation and suggests ways of coping with it.

As a professional armed with current information from governmental sources and industry associations and daily experiences in dealing with limited energy resources, the school bus operator may be the only individual in the local community equipped to develop a response to changing energy conditions and local transportation requirements with maximum effectiveness.

The remaining discussion in the document addresses the practical issues involved in accepting this responsibility and playing these roles effectively. For additional information contact the National School Transportation Association.

About ASBO and Its Purpose

THE Association of School Business Officials of the United States and Canada, an international professional educational management-oriented organization, is the oldest and largest association in North America devoted exclusively to the improvement and advancement of school business management, public and private.

Founded in 1910 through the auspices of the U.S. Office of Education, ASBO is dedicated to researching, analyzing and publicizing improved methods of school business management in 23 specialties. ASBO's membership of about 5,500 active members is from all 50 states, 10 provinces of Canada and overseas.

An integral part of ASBO is its "Research Corporation," a publishing/research subsidiary devoted to advancing educational management at all levels by conducting and promoting significant research programs in all facets of school business management. Twenty-three research committees, staffed with several hundred "expert" generalists and specialists continually confront the biggest issues facing educators.

Statement of Purpose

The Association of School Business Officials of the United States and Canada is a nonprofit, educational organization dedicated to researching, determining and publicizing better methods of school business administration.

ASBO has as its concern the improvement of efficiency in school business management.

In today's highly competitive world, the demands made on the school business official's time and skill are increasing. At a time when school business operations have reached an unparalleled degree of complexity and the maintenance of efficiency and service has become a major problem, school business officials are being asked to perform their jobs with even greater precision and effectiveness.

In this environment, the Association of School Business Officials has an obligation to aid the modern school business official in the performance of his duties and responsibilities. ASBO does this by bringing to the attention of its members new and accurate management methods, tools, techniques and procedures that will enable them to better perform their management functions of planning, organizing, coordinating, controlling, evaluating, improving — AND the wise expenditure of the taxpayer's money with which they have been entrusted.

This is accomplished through the ASBO educational program of workshops, conferences, discussion groups, annual meetings and a far reaching publications program. It also includes the encouragement of courses and programs in the field by recognized and accredited colleges and universities, the sponsoring of research projects and the encouragement of other research projects in the field.

ASBO's monthly journal, SCHOOL BUSINESS AFFAIRS and its ASBO ACCENTS newsletter are publications representative of the ASBO educational program — "of school business management, by school business officials, for the improvement of school business administration."